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Ministry of Energy Resources Inaugurated

40130095 Beijing XINHUA Domestic Service in Chinese 1336 GMT 22 Jun 88

[By reporters Huang Fengchu and Zhao Mingliang]

[Text] Beijing, 22 Jun (XINHUA)--The Ministry of Energy Resources--another result of the organizational restructuring of the State Council--was inaugurated in Beijing today. On behalf of Premier Li Peng and the State Council, State Councilor Wang Bingqian extended his congratulations and spoke at the inaugural meeting.

The Ministry of Energy Resources is made up of the former Ministry of Coal Industry, Ministry of Petroleum Industry, Ministry of Nuclear Power Industry, and the Electric Power Department of the Ministry of Water Resources and Electric Power. Currently, it consists of 20 functional organs and has 700 personnel.

In his inaugural speech, Wang Bingqian pointed out: The establishment of the Ministry of Energy Resources is an experiment in restructuring government organs. In restructuring the various ministries and commissions, the establishment of the Ministry of Energy Resources involved many organs and people. The establishment of the Ministry of Energy Resources will play an important role in speeding up the exploitation of energy resources and the development of the energy industry in China. He hoped that the new ministry will earnestly analyze the energy resource situation in China; gain full understanding of the importance of accelerating the development of the energy industry; actively conduct experimental reforms; ensure separation of party functions from enterprise management; and speed up development through reforms.

Wang Bingqian pointed out: In establishing the Ministry of Energy Resources, the central authorities mainly hope to speed up development of the energy industry; optimize the structure of and strive to upgrade the industry, which is a prominent weak link in China's economic development; and prevent the industry from hampering China's socialist modernization efforts. These are also historical tasks to be shouldered by all staff and workers on the energy front. Wang Bingqian said: The Ministry of Energy Resources has much work to do after its establishment. The two central tasks that require persistent efforts are separation of government

administration from enterprise management and separation of party and government functions. The two most important things the ministry should do are to ensure proper overall planning of development projects, including launching of major projects, and to formulate proper principles and policies, including drawing up important regulations and standards so that the energy industry will develop more rapidly and in an planned way. [as printed]

In his speech at the inaugural meeting, Huang Yicheng, minister of energy resources, said: As a new organization established in the environment of reform, everyone, from the minister to ordinary workers, of the Ministry of Energy Resources must develop a new mentality, new concepts, and a new workstyle. He called on the staff and workers of the ministry to develop a work style of seeking truth from facts; promoting democracy; earnestly and resolutely doing their jobs; and wholeheartedly serving the people and the grass roots. He stressed that everyone must be honest in carrying out his duties.

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Huang Yicheng on Reforming Nation's Energy Sector

40130083 Shanghai JIFANG RIBAO in Chinese 19 Apr 88 p 3

[Article by Di Jianrong [3695 1696 2837]: "On Reforming the Nation's Energy Sector--Interview With Newly Appointed Energy Minister"]

[Text] The Seventh National People's Congress has voted on the new term of State Council officials and elected a number of experts to their posts. This reporter interviewed one of the expert officials, Minister Huang Yicheng of the newly formed Ministry of Energy to hear his views on the issues.

I entered the office of Minister Huang, an expert minister who had served in the New Fourth Army and studied in the Soviet Union, and saw him at his desk, intently studying some documents. Seeing me entering, he laid down his pen and offered me a seat.

Among the ministries and committees of the State Council, the newly formed Ministry of Energy has attracted considerable attention. It was formed following some major changes: the old Ministry of Coal Industry, Ministry of Petroleum Industry and Ministry of Nuclear Industry were eliminated and the electric power portion of the Ministry of Water Conservancy and Electric Power has become part of the new Ministry of Energy. Our conversation began on these changes.

Minister Huang said that an important shortfall in China's old economic system was the lack of separation between the government and the enterprises. This lack of separation not only impeded the operation of the administration, but also thwarted the initiativeness of the enterprises. The most recent organizational reform was aimed to correct the situation of a mixed administration and enterprises. The new Ministry of Energy will no longer run the enterprises directly; the industrial enterprises will be run by companies. The attention of the Ministry of Energy will be placed on energy policies. With this change of function, there is no longer a need to have separate ministries for the petroleum, coal, and electric power industries. This change is in the spirit of reform and also meets the need in the development of the energy industry.

He also told me that the old ministries each had more than a thousand employees. After the establishment of the Ministry of Energy, the functions were to change and the number of employees would be kept below 500. The organization will be much more compact than before.

Huang was among the first group of students to study in the Soviet Union after the establishment of the People's Republic. He specialized in the manufacture of steam turbines. Huang returned to China in 1954 and had a long career in electrical machinery manufacturing. He served as plant director, chief engineer, and deputy party secretary. In 1979 he was transferred to the state planning council and served as a deputy bureau chief. Since 1982 he was the deputy director of the State Planning Commission in charge of energy. He has a good grasp of the energy problems. In responding to my question on what the Ministry of Energy will do to solve the energy shortage, especially in electrical energy, that has affected the national economic development, Minister Huang gave me the following answer.

The rate of growth in electrical energy has been fairly fast in the past few years, but the demands are growing at a faster pace. As a result, the supply cannot satisfy the demand. To solve this problem on a national level, efforts must be devoted to two areas: develop the energy industry and control the consumer demand. The task of the Ministry of Energy is on the former and the approach should be through reform. So how will the reform be implemented? I asked.

Huang said that two things must be done with the present situation. First, favorable conditions must be created for the development of the various industries, that is, an energy development policy must be established. For example, China has a hydroelectric power reserve of 380 million kilowatts, out of which only 20 to 30 million kilowatts have been developed and there exists a great potential for development. However, the development in hydroelectric power in recent years has been slow and the percentage in the total energy makeup has been declining. The basic reason is the lack of an energy policy that promotes the development of hydroelectric power. Hydroelectric power has its disadvantages and advantages. The disadvantages are that the investment is high and the return period is long. The advantages are that it is non-polluting, its operating costs are low and its efficiency is good. The cost for producing 1 kilowatt-hour of hydroelectric power is less than 0.01 yuan while that for thermal electric power is 0.03 to 0.04 yuan. Today the accounting of the hydroelectric power stations and that of the thermal electric power grid are the same, and the hydro stations cannot benefit from their low costs and high efficiency. The advantages of hydropower are not exploited while the disadvantages are plainly visible. There are therefore no incentives for developing hydroelectric power and the government cannot afford such an effort. If some reform measures are taken to break the habit of hydro and thermal power sharing the same big pot, and for them to have independent economic accounting procedures so that they may buy or sell power from each other, then the profits of the hydropower stations will be greatly improved. Although the investment is large for hydropower, the higher profits will permit a faster return. With these reforms, there will be incentives for developing hydropower, even with borrowed money, and there will be a future for hydroelectric power. There are a number of other similar situations in the energy industry. If we can implement some reform to provide incentives for the various enterprises, the entire energy industry will have a much brighter future.

"What is the second thing?" I asked. Minister Huang said: "The second thing is to increase our productivity, something that we have tried for many years without complete success. Our present method for computing productivity is based on how much money a worker generates. This method has its drawbacks because product price fluctuates and the amount of money generated cannot truly reflect the level of productivity. I believe that we should base the productivity on the amount of products produced."

I told him that his idea made sense and asked him to talk about the specifics for improving productivity. His answers were technology and management. They sounded like old hat, but really are much deeper. Two of the most important things in management are the quality and awareness of the workers and the distribution of work. If the workers are poorly educated, unmotivated, lacking in discipline and sense of responsibility, then productivity cannot be improved even with the best system and equipments. The work ethics is a serious problem of today. Employee training and indoctrinations to raise the awareness and moral standards of are urgently needed. Bonuses alone do not make good enterprises.

"Of course," he said, "This is not denying the role of material rewards. On the contrary, the 'big pot' must be gotten rid of. The current method of allocating total wages based on head-count is not a good system. It does not encourage the enterprises to use less people; in fact, it has just the opposite effect. I am therefore for reform, and for allocating wages based on production and not head-count. In the electric power industry this would be the amount of electric energy produced. Encouragement for reducing personnel and increasing production should be provided; the allocation should not be decreased or increased when there is a reduction or increase in personnel. Only with increased productivity, to quote Lenin, can the socialist new system prevail over the capitalist old system."

Finally, Huang Yicheng said confidently that, with the two reform measures to create favorable conditions for the enterprises and to increase productivity, the Chinese energy industry will be in much better shape in 5 or 10 years.

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Solutions Offered To Ease Energy Crunch Projected for 1995

40130075 Beijing ZHONGGUO KEJI LUNTAN [FORUM ON SCIENCE AND TECHNOLOGY IN CHINA] in Chinese No 2, 1988 pp 46-48

[Article by Li Zhihua [2621 2784 5478]: "Energy Shortage To Occur in China Around 1995"]

[Text] Energy resources are the foundation of economic development and an essential part of people's lives. Many experts in China have done predictive research to forecast energy consumption and most feel that energy consumption in China will reach 1.4 to 1.5 billion tons of standard coal by the year 2000. Scholars also have studied production forecasts but most did so separately from consumption forecasts. To combine the two, our research involved forecasts which include both energy production and energy consumption in the same model. We also used six types of models, a linear regression model, non-linear regression model, exponential smoothing model, combined linear regression/time sequence model, combined non-linear regression/time sequence model, and gray forecast model, for simultaneous projection of energy production and consumption. Our projections point to a national energy crunch in China after 1995 with a shortage of 50 to 60 million tons of standard coal. We will introduce our research results and related questions and suggest countermeasures to make up for the energy shortage.

I.

To simplify the models, we assumed that energy production was closely related only to the two factors of cumulative investments in the energy industry and railway freight volume, and that energy consumption was related only to the two factors of total national population and gross national value of industrial and agricultural output. All the original data used in the projections were based on openly-published Chinese statistical data: China's total population will be 1.2 billion in the year 2000, the gross value of industrial and agricultural output will be quadruple that in 1980, the average rate of increase in cumulative investments in the energy industry between 1986 and 2000 will be 5.3 percent, and the average rate of growth in railway freight volume will be 4.0 percent. Moreover, it was assumed that the ratio between the amount of coal shipped and the amount of other goods shipped would not change during this period.

These six models were used to project energy production and consumption in China, and the results are shown in Table 1.

Table 1. Projected Energy Resource Production and Energy Resource Consumption in China, 1986-2000

unit: 10,000t of standard coal

Projection model		Time of projection				(1)	Amount of shortage
		1986	1990	1995	2000		
Linear regression	prod.	90 629	104 832	125 945	151 609	2000	3268
	cons.	82 269	97 544	122 069	154 877		
Non-linear regression	prod.	98 934	109 686	124 775	141 929	2000	5616
	cons.	79 359	94 744	118 232	147 545		
Exponential smoothing	prod.	85 190	99 037	116 346	133 655	2000	3175
	cons.	78 249	93 242	113 946	136 830		
Linear regression/ time sequence	prod.	90 717	105 025	125 933	151 608	2000	3276
	cons.	81 775	97 680	122 039	154 884		
Non-linear regression/ time sequence	prod.	93 893	109 153	124 941	141 924	2000	5690
	cons.	80 645	95 305	118 429	147 624		
Gray projection	prod.	81 657	93 875	111 703	132 970	1995	395
	cons.	75 733	90 153	112 098	139 385	2000	6445

Key:

(1) Year in which shortage will appear

The following conclusions can be drawn from the table:

1. The projections in all six models point to an energy shortage in the year 2000.

2. The linear projection model and the exponential smoothing model indicated that the energy shortage in 2000 will be about 30 million tons of standard coal. The data derived in the non-linear projection model and the gray projection model were that the energy shortage in the year 2000 will be about 50 to 60 million tons of standard coal.

3. The results of the gray model projection were that China will have an energy shortage of 3.95 million tons of standard coal by 1995.

If the projected results are plotted as curves, it is more evident that the year in which an energy shortage appears in the six different projection methods varies, but usually falls between 1995 and 2000. Only in the gray forecast does it come before 1995. Thus, it can be assumed that an energy crunch will appear around 1995.

II.

Our six models can be divided into two groups. The first five models are classical projection models, while the last one, the gray projection model, is a new forecasting model. A regression model is a type of projection model which uses the causal relationship between independent variables and predicted parameters. If this causal relationship is linear, it is a linear regression model. If this causal relationship is greater than linear, it is a non-linear regression projection model. Because more factors must be considered in a non-linear relationship than in a linear relationship, non-linear regression models usually are more accurate than linear regression models. Besides considering the relationship between independent variables and predicted parameters, attention also should be given to the effects of random processes on the predicted parameters. This is a combined regression/time sequence model. This combined model also has linear and non-linear components. This is due mainly to linearity and non-linearity in the causal relationship. Likewise, a combined non-linear regression/time sequence model is more accurate than a linear one. The gray prediction model is suitable for use with social and economic systems. This model acknowledges the existence of macro regularities in the predicted system, but considers micro regularities to be weak. The degree of regularity can be increased via additional information. This sort of model can deal with the effects of random processes without using probability methods. Macro regularities in the system are described via differential equations. This is a newer and more accurate forecasting model.

III.

To suggest countermeasures to make up for the energy shortage and enable us to understand the concept of degree of importance, both energy production and energy consumption in this article are related to two independent variables.

Inputting original data into a normal independent variable permits the derivation of projections as shown in Table 1. If, on the basis of normal input data, a certain additional amount is added to or subtracted from a certain independent variable, the predicted result will change. The ratio between the relative change in the predicted result and the relative change in the independent variable is called the degree of importance of the independent variable toward the predicted result. A greater degree of importance indicates that the independent variable has a greater effect on the predicted result. Table 2 lists the degree of importance value of each independent variable for predicting energy production or consumption.

Table 2. Degree of Importance Values

Degree of importance	Energy production		Energy consumption	
	Cumulative investments in energy resources	Railway freight volume	Total population	Gross value of industrial and agricultural output
Value	0.47	0.65	4.69	0.612

Based on the degree of importance values listed in Table 2, the following countermeasures can be suggested:

1. Increasing railway freight volume has a greater effect on increasing energy production than does increasing cumulative investments in energy. Thus, the first thing we must do is devise ways to increase the railway freight volume or the proportion of energy resources in the railway freight volume. The second thing is a suitable increase in cumulative investments in the energy industry.

To increase the railway freight volume, methods instead of increasing the railway freight volume can be adopted, mainly:

1) Develop pit-mouth coal-fired power stations, substitute power transmission for coal transport. Electric power is a highly efficient energy resource, and the development of electric power can improve efficiency or reduce the amount of coal shipped by rail. The result of increased efficiency is the same as reducing consumption, so it kills two birds with one stone.

2) Develop a suitable number of nuclear power stations in the economically-developed coastal regions of southeast China which have coal shortages; develop a suitable number of thermonuclear power stations in frigid regions of north China. Nuclear power is an energy resource with a high specific energy, so a small amount of nuclear fuel can be shipped instead of a large amount of coal. Moreover, nuclear energy is an extremely clean and safe energy resource.

3) Develop advanced coal burning technologies like coal gasification or liquefaction. The product of coal gasification or liquefaction can be shipped by pipeline. The development of advanced coal burning technologies can reduce the railway freight volume as well as environmental pollution, so they are new technologies which should be developed.

2. In energy consumption, the role of controlling population growth is more important than the role of increasing the gross value of industrial and agricultural output. This can be illustrated in two areas. First, given the present situation, it may be possible to achieve the goal of quadrupling the gross value of industrial and agricultural output by the year 2000 ahead of schedule, which is a good thing, but this also would increase the energy shortage. Our ability to hold the population to within 1.2 billion will be determined by implementation of family planning work throughout China. The present situation indicates that 1.2 billion may be exceeded. If this happens, the energy shortage in 2000 will be even larger. Second, in consideration of the degrees of importance shown in Table 2, the effect of growth in total national population on energy consumption is far greater than the effect of the gross value of industrial and agricultural output. For this reason, we must be highly concerned with family planning work throughout China and strictly hold the national population within 1.2 billion.

Besides controlling the above factors to make up for the shortage, we also can consider others:

1) Reinforce energy conservation work. Since the elasticity coefficient and unit value of output of energy resources in China are greater than those of energy consumption, there still is potential for energy conservation which can be exploited.

2) Reducing consumption and importing energy resources also can solve the energy shortage, but these are not the best solutions to the problem.

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Vice Minister Reviews Status of Three Gorges Study

40130096 Beijing LIAOWANG in Chinese No 22, 30 May 88 pp 22-25

[By LIAOWANG reporter: "Lu Youmei Speaks About Progress in Feasibility Study on Three Gorges Project"]

[Text] Editor's note: The [envisioned] Three Gorges project on the Chang Jiang would be the biggest water control project in the world. The enormous scale, the huge investment, and the difficulties involved indicate that the project will have a great impact on our nation. Therefore, we must adopt a prudent and scientific attitude in determining whether the project should be built or not and whether the project should be built immediately or in the future.

It is over 50 hears now since feasibility studies on the Three Gorges project first started. For over half a century, many experts and scientists have made painstaking efforts in carrying out scientific researches and scientific demonstrations on the Three Gorges project. As a result, our understanding of the Three Gorges project has been strengthened.

In his report to the 13th CPC National Congress, Comrade Zhao Ziyang pointed out that "the basic principle for establishing a system of consultation and dialogue is to carry on the fine tradition of "from the masses, to the masses" and to make public the activities of the leading bodies, letting the people know about important events and discuss important issues." So, any major decisions concerning the Three Gorges project should be made public and should be made known to more people.

In order to achieve this goal, we interviewed Wang Ganchang, a well-known physicist, and Lu Youmei, a hydropower engineering expert and deputy head of the leading group in charge of the feasibility study on the Three Gorges project. Comrade Wang Ganchang once wrote a review of a book entitled "On Macroscopic Decision-making Concerning the Three Gorges Project." The book contains many views which suggest that the Three Gorges project should not be built or should not be built immediately. Comrade Lu Youmei is one of the leaders in charge of the work of scientific demonstration on the Three Gorges project and is therefore quite familiar with the progress of the scientific demonstrations on the Three Gorges project. Detailed reports on the two special interviews are now published by our magazine. The reports on the two interviews contain

widely divergent views on the Three Gorges project which have been expressed by many experts. The book can be used as reference material by all those who are concerned about the progress of the scientific demonstrations on the Three Gorges project. [end editor's note]

The question of whether or not it is necessary to build the Three Gorges project and whether it is necessary to build the Three Gorges project immediately or in the future in the course of the development of the Chang Jiang, the longest river in our country, has attracted the attention of people of all walks of life at home and abroad. With this question in mind, our reporters interviewed Lu Youmei, deputy head of the leading group in charge of the feasibility study on the Three Gorges project and vice minister of energy resources, and asked him to talk about the situation concerning the feasibility study on the Three Gorges project and to answer some questions in this respect.

The Historical Background of the Three Gorges Project

During the interview, Lu Youmei first talked about the historical background of the Three Gorges project.

The idea of building a hydropower station in the Three Gorges was originally put forward by the great revolutionary forerunner Dr Sun Yat-sen. In his "Strategies and Plans for the Building of the Country," Dr Sun Yat-sen made the first mention of the grand Three Gorges project. After the victory of the war of resistance against Japan, the KMT government and the U.S. Government made joint efforts in carrying out scientific explorations and a feasibility study on the Three Gorges project and put forward specific plans for the building of such a project.

Since the founding of the PRC, for over 30 years since the 1950's, the Chang Jiang Valley Planning Office has carried out comprehensive scientific exploration, planning, designing, and feasibility studies on the Chang Jiang Valley and on the Three Gorges project. At the same time, the question of whether it is necessary to build the Three Gorges project or not and the question of the exact height of the dam of the project became the central topics for discussion in the Ministry of Water Resources and Electric Power and among people of all walks of life. In the 1950's, one favorable plan concerning the building of the Three Gorges project was to build a high dam with a normal water level of 200 meters above sea level and an installed capacity of 2.5 million kilowatts.

In 1983, the former Ministry of Water Resources and Electric Power thought that according to the abovementioned construction plan, the state would have to move a large number of people from the areas where the project would be built. Therefore, after careful consideration, the Ministry of Water Resources and Electric Power put forward a feasibility study report on building a low dam with a height of 165 meters and a normal water level of 150 meters. Then, the State Planning Commission organized more than 200 experts to examine the feasibility study report. After examining it, the experts agreed in principle to submit the feasibility study report to the State Council. As a result, the State Council approved the feasibility study report in principle in April 1984,

but raised the height of the dam from 165 meters to 175 meters for the reason that a higher-water-level dam can certainly hold more water during the flood season so as to better protect the areas in the middle and lower reaches of the Chang Jiang.

In September 1984, the Chongqing City People's Government voiced its disagreement with the construction plan approved by the State Council. The Chongqing City's People's Government thought that according to the original plan of building a dam with a normal water level of 150 meters, the backwater could not reach Chongqing City and thus could not meet the needs of the development of the marine transport industry on the Chang Jiang. The Chongqing City's People's Government suggested raising the normal water level of the dam to 180 meters so that 10,000-ton vessels could reach Chongqing City.

Soon afterward, the State Council asked the State Planning Commission and the State Science and Technology Commission to hold further scientific demonstrations on the proposed normal water level of the dam. During this period, the question of the Three Gorges project caused wide concern across the country. Opinions on whether to build the project or not, whether to build the project immediately or not, whether to build a higher dam or a lower dam, and so on were put forward one after another. The authorities also began carrying out scientific exploration on a series of questions concerning the Three Gorges project, such as the impact of the project on our national economic development, the impact of the project on the silting and ecological environment of the Chang Jiang, the impact of the project on the residents of the areas where the project would be built, who would have to be moved to other areas of the country, and other questions. Since then, there has been a lot of discussion on the Three Gorges project, and more detailed and more in-depth scientific research has been carried out on all questions concerning the building of the project.

Central leaders have also given great attention to the Three Gorges project. In April 1986, headed by Comrade Zhao Ziyang and Comrade Li Peng, leaders and experts of the departments concerned carried out a number of spot investigations on the Chang Jiang. In June 1986, the CPC Central Committee and the State Council jointly issued the "Notice on Questions Concerning Scientific Demonstration on the Three Gorges project on the Chang Jiang," requiring the Ministry of Water Resources and Electric Power to reorganize scientific demonstrations on the Three Gorges project and pointing out that "the scientific demonstrations on the Three Gorges project on the Chang Jiang must be attended by experts with widely divergent views and technological democracy must be developed so that all questions concerning the building of the Three Gorges project on the Chang Jiang will be fully discussed..."

Lu Youmei said that later on, the spirit of the "Notice on Questions Concerning Scientific Demonstration on the Three Gorges Project on the Chang Jiang" became the guiding ideology in the entire work of scientific demonstration on the Three Gorges project.

The Plan for Organizing Scientific Demonstrations on the Three Gorges Project on the Chang Jiang

It is quite true that the former Ministry of Water Resources and Electric Power was the department responsible for organizing the scientific demonstrations on the Three Gorges project. However, how to organize the demonstrations on the project was no doubt a challenge to the former ministry. Lu Youmei said that they had to make use of all the existing achievements of scientific research and should not stick to their own conclusions on the project. Therefore, after carrying out conscientious discussions, the leading party group of the Ministry of Water Resources and Electric Power formulated the following principle to govern the work of organizing scientific demonstrations on the Three Gorges project: To smash departmentalism, develop technological democracy, work hard, and make the greatest efforts to carry out the scientific demonstrations on the project, formulate a new feasibility study report on a strictly scientific basis, and produce a new feasibility study report which can stand the test of history.

Lu Youmei said that the former Ministry of Water Resources and Electric Power made the following arrangements for the work of organizing the scientific demonstrations on the Three Gorges project.

1. The Ministry of Water Resources and Electric Power set up a leading group in charge of the work of scientific demonstrations on the Three Gorges project. The leading group consisted of the minister and vice minister of water resources and electric power, the chief engineer and deputy chief engineer concerned, and leaders of the relevant departments.

2. In order to accept the guidance and supervision of all sides, the leading group in charge of the work of scientific demonstrations on the Three Gorges project invited some 20 advisors from various departments under the State Council to work with it. All these advisors had been recommended to the leading group by the various departments under the State Council. These advisors included: Ma Bin, advisor to the Economic, Technological, and Social Development Research Center under the State Council; Wang Jing, director of the No 1 Key Construction Bureau under the State Planning Commission; Wang Qian, vice chairman of the Financial and Economic Committee under the NPC; Wang Hanzhang, deputy governor of Hubei Province; Bi Dachuan, deputy director of the National Research Center for Science and Technology Development under the State Science and Technology Commission; Liu Guoguang, economist and vice president of the China Academy of Social Sciences; Sun Zonghai, general engineer of the Industrial Technology Bureau of the State Science and Technology Commission; Sun Honglie, vice president of the China Academy of Sciences; Sun Yueqi, head of the CPPCC's Work Group for Economic Construction; Shen Hong, a mechanical expert and vice chairman of the Law Committee of the NPC; Li Qiang, Advisor to the State Council and former minister of foreign economic relations and trade; Li Boning, director of the State Council's Office in Charge of Economic Development in the Three Gorges Area; Chi Haibin, vice minister of finance; Zhang Wei, vice chairman of the China Science and Technology Association; Zhao Mingsheng, member of the State

Machine-building Industry Commission; Hu Zhaosen, member of the State Science and Technology Commission and deputy director of the Standing Committee of the State Natural Sciences Foundation; Qian Yongchang, minister of communications; Xu Lizhang, deputy director of the Planning Research Center of the State Planning Commission; Jiang Zhaozu, vice president of the China International Engineering Consulting Corporation, and Pu Haiqing, former deputy governor of Sichuan Province.

3. After 10 major issues concerning the Three Gorges project were analyzed, 14 expert groups were set up according to the specific requirements of the issues. The 14 expert groups were: The Geology and Earthquake Expert Group, the Key Project Expert Group, the Hydrology Expert Group, the Flood Prevention Expert Group, the Silt Expert Group, the Shipping Expert Group, the Electric Power System Expert Group, the Mechanical and Electric Equipment Expert Group, the Emigration Expert Group, the Ecology and Environment Expert Group, the Comprehensive Planning Expert Group, the Water Level and Construction Expert Group, the Investment Appraisal Expert Group, and the Comprehensive Economic Appraisal Expert Group. The directors, deputy directors, and advisors of all the 14 expert groups had been invited from the various departments under the State Council according to the actual needs of the various kinds of work after sufficient consultations among all the departments concerned. When employing the directors, deputy directors, and advisors of the 14 expert groups, we took into full consideration the academic authority of some experts and employed both the renowned veteran experts and the promising young and middle-aged experts who had made some outstanding contributions to our country. The expert groups consist of representatives of the departments and localities concerned and the representatives of widely divergent views. Therefore, each member of an expert group represents a wide range of interests. For example, the two advisors, one director, and three deputy directors of the Geology and Earthquake Expert Group are: Advisor Chen Zongji, who is also director of the Institute of Geophysics of the China Academy of Sciences and a member of the Scientific Council of the China Academy of Sciences, Advisor Jia Fuhai, who is also senior engineer of the Ministry of Geology and Mineral Resources and a member of the Scientific Council of the China Academy of Sciences, Director Dai Guangxiu, who also is deputy general engineer of the Hydrogeology and Engineering Geology Department of the Ministry of Geology and Mineral Resources, Deputy Director Li Ping, who also is a research fellow of the Institute of Geology of the State Seismological Bureau, Deputy Director Wang Sijing, who is also deputy director of the Institute of Geology of the China Academy of Sciences, and Deputy Director Jiang Guojie, who is also consultant to the Water Resources and Hydropower Planning and Design Institute of the Ministry of Water Resources and Electric Power. The two advisors, one director, and three deputy directors of the Ecology and Environment Expert Group are: Advisor Hou Xueyu, who is also advisor to the Environmental Protection Committee under the State Council, a member of the Scientific Council of the China Academy of Sciences, and a research fellow of the Institute of Botany, Advisor Huang Bingwei, who is also president of the China Geography Society and a member of the Scientific Council of the China Academy of Sciences, Director Ma Shijun,

who is also advisor to the Environmental Protection Committee under the State Council, honorary president of the China Ecological Society, chairman of the Committee of Environmental Science under the China Academy of Sciences, and a member of the Scientific Council of the China Academy of Sciences, Deputy Director Yan Kai, who is also president of the China Society of Hydraulic Engineering, honorary president of Hehai University, and a member of the Scientific Council of the China Academy of Sciences, Deputy Director Sun Hongbing, who is also senior engineer of the State Environmental Protection Bureau, Deputy Director Gao Fuhui, who is also president and research fellow of the Chengdu Branch of the China Academy of Sciences.

The 14 expert groups employ a total of 412 experts and advisors of 40 specialities, among whom there are 213 experts and advisors from the water resources and electric power department, accounting for some 51.7 percent of the total number of experts and advisors employed by the 14 expert groups, and there are 15 members of the Scientific Council of the Chinese Academy of Sciences, 66 professors and associate professors, 38 research fellows and deputy research fellows, and 251 senior engineers, altogether accounting for some 89.8 percent of the total number of experts and advisors employed by the 14 expert groups.

After giving a brief account of the various expert groups, Lu Youmei stressed that apart from the 412 experts and advisors, many other people have also taken part in the scientific demonstrations on the Three Gorges project. Many universities and colleges, research institutions, survey and design units, and some other units have also taken part in the relevant scientific experiments, surveys, investigations, and research. We have also cooperated with Canada and the World Bank in carrying out the scientific demonstrations on the Three Gorges project. China, Canada, and the World Bank also jointly set up a Guidance Committee. The World Bank also nominated some internationally renowned experts (including experts of our country) to form an International Expert Group. Under the supervision of the Guidance Committee and the International Expert Group and with the help of the funds granted by the Canadian Government, a Consultative Group was jointly established by five most experienced Canadian government institutions and private companies. The Consultative Group is responsible for formulating the feasibility study report on the Three Gorges project according to relevant international standards. It is expected that by the 3d quarter of this year, the Consultative Group will have produced its final feasibility study report on the Three Gorges project. Carrying out the scientific demonstrations on the Three Gorges project with the help of both domestic and foreign experts can guarantee the accuracy of the scientific demonstrations on the Three Gorges project and improve the quality of the feasibility study on the Three Gorges project.

The Progress of the Scientific Demonstrations on The Three Gorges Project

Lu Youmei also talked about the progress of the scientific demonstrations on the Three Gorges project. He said that the overall scientific demonstration on the Three Gorges project was unfolded after goals, requirements, methods, procedures, and work programs for discussing the various special questions concerning the project were decided upon.

The first and foremost task was to select a water level acceptable to all. Some people thought that this method of carrying out the scientific demonstration was not a scientific way of doing things because selecting a water level meant that the Three Gorges project would certainly be built, as though a conclusion had already been reached before the scientific demonstrations on the Three Gorges project had actually started. Lu Youmei thought that this was a misunderstanding because it is really necessary to select a suitable water level first. Since the Three Gorges project is a big project, different water levels could produce different results. The total water storage volume of a 180-meter dam is double that of a 150-meter dam. The number of people to be moved from the area where a 180-meter dam would be built is double the number of people to be moved from the area where a 150-meter dam would be built. Some 150-meter and 180-meter dams also differ in their respective capabilities for carrying out flood prevention, power generation, and marine transport and with regard to the actual investment, because 150-meter and 180-meter dams will encounter different silt and environmental problems. Therefore, if the experts and scientists did not have a water-level plan to which they could refer, it would be impossible for them to carry out the scientific demonstrations on the Three Gorges project or to find an alternative water-level plan which could produce approximately the same results under the circumstances that they ever decided not to built the Three Gorges project or not to build the Three Gorges project immediately. Lu Youmei believed that selecting a water-level plan for reference was quite logical in terms of the methods and procedures of the scientific demonstrations on the Three Gorges project and was conducive to further carrying out scientific demonstrations on various special questions concerning the Three Gorges project and to discovering the internal relations and contradictions among the various special questions concerning the Three Gorges project. Lu Youmei stressed that the initial water-level plan was not the final water-level plan. The initial water-level plan could be amended in the course of the scientific demonstrations on the Three Gorges project.

After repeated discussions, the initial water-level plan was examined and approved by the fourth enlarged meeting of the Leading Group in April 1987. The contents of the initial water-level plan include: "First-grade development, one-time construction, water storage in phases, and consecutive emigration." The specific figures for the initial water-level plan are: A dam with a height of 185 meters, a final normal water level of 175 meters, and an initial water level of 156 meters.

Scientific demonstrations were soon carried out on the initial water-level plan. Seminars held on flood prevention, power generation, and marine transport suggested that the Three Gorges project should not be built and at the same time put forward alternative plans.

Up to now, the Leading Group has already held eight enlarged meetings and examined one by one and approved in principle the reports of the seminars. The only remaining reports to be examined and approved by the Leading Group are the report of the seminar held on comprehensive planning and water level and the report of the seminar held on comprehensive economic appraisal.

Finally, the Leading Group will re-formulate the feasibility study report on the Three Gorges project on the basis of all the scientific demonstrations carried out in the various seminars. Lu Youmei said that they will do their best to accomplish the work of scientific demonstration on the Three Gorges project within this year and submit their final report to the State Project Examination Committee, which is under the State Council.

Explanations on Several Questions

After Lu Youmei gave a brief account of the situation concerning the scientific demonstrations on the Three Gorges project, reporters asked him several questions. Lu Youmei answered the reporters' questions one by one.

/Reporter: Some people say that the building of the Three Gorges project has already been internally decided upon by the authorities, and that the scientific demonstrations currently being carried out on the Three Gorges project are only superficial. What is your comment on this view?

/Lu Youmei:/ Some of the major projects built by our country have suffered losses because we did not carry out the necessary scientific demonstrations on them. The reason we have been carrying out in-depth and comprehensive scientific demonstrations on the Three Gorges project is because we want to draw a lesson from our past failures and place our decisionmaking process on a more scientific basis. While carrying out the scientific demonstrations on the Three Gorges project, we have not received any pressure from the higher authorities. The State Council has instructed us to gain a clear idea of all the technological questions concerning the Three Gorges project. In my view, no matter what macroscopic decisions the state makes, to make clear whether the building of the Three Gorges project is technologically and economically feasible is the responsibility of the scientists. Only the experts can reach a conclusion on this question. The conclusion should not be reached by any leader or by ballot.

/Reporter: In the past, newspapers seldom reported on the scientific demonstrations on the Three Gorges project. Is it true that you have been carrying out the scientific demonstrations on the Three Gorges project in secret?

/Lu Youmei:/ The scientific demonstrations on the Three Gorges project have been carried out in public, not in secret. Because the Three Gorges project concerns a lot of complicated economic, technological, theoretical, and practical questions, the scientific demonstrations on the Three Gorges project are very professional in nature. And it is very difficult to reach any specific conclusion on the Three Gorges project through discussions in newspapers and other publications. What is more, at present, the scientific demonstrations on the Three Gorges project are still being carried out and no specific conclusion has been reached on the project. Therefore, we do not have much to report in the newspapers.

/Reporter: How do you absorb the widely divergent views expressed in the course of the scientific demonstrations on the Three Gorges project?

/Lu Youmei:/ The seminars held on each special question concerning the building of the Three Gorges project will finally produce a feasibility study report on the project. If some experts who participate in these seminars disagree with the report, they can choose not to sign their names to the report and to put down their own views at the end of the report so that their views will be carefully considered when the comprehensive scientific demonstrations are held on the Three Gorges project. In order to guarantee technological democracy and enable the experts to have more opportunities to express their views on the Three Gorges project, we have adopted the following procedure in discussing and examining each of the special questions concerning the building of the project: The Leading Group will hold an enlarged meeting. The expert groups will first submit their reports approved at various seminars on special questions concerning the building of the Three Gorges project. The comrades attending the enlarged meeting held by the Leading Group will then ask questions on these reports; and the expert groups concerned will answer the questions and offer the necessary explanations. Then all the comrades attending the enlarged meeting held by the Leading Group will spend some time reading these reports and the relevant documents and prepare their own views on them; after which all the comrades attending the enlarged meeting held by the Leading Group will hold discussions on these reports. On the basis of these discussions, the Leading Group will hold a group meeting attended by the members of the Leading Group, the special advisors of the Leading Group, the president of the China Hydraulic Engineering Society, the president of the China Electrical Engineering Society, and the president of the China Hydroelectric Engineering Society. The group meeting will mainly discuss the conclusions reached by the various seminars on various special questions concerning the building of the Three Gorges project, including the views expressed by the experts who disagree with the conclusions reached by the various seminars. Then the various expert groups will properly amend the reports approved by the various expert groups at various seminars on special questions concerning the building of the Three Gorges project and formulate their final reports. Thus all the views expressed by the experts will be taken into consideration. Subjectively speaking, we have made special efforts to overcome the limitations of our own department in the course of the scientific demonstrations on the Three Gorges project.

/Reporter: In what way do you carry out the scientific demonstrations on major questions concerning the Three Gorges project?

/Lu Youmei:/ We have adopted a very strict and scientific attitude in carrying out the scientific demonstrations on the major questions concerning the Three Gorges project; and our scientific demonstrations have never been restricted by any of our existing conclusions because our scientific demonstrations on the Three Gorges project must stand the test of history. For example, when carrying out the scientific demonstrations on questions concerning geology and earthquakes, the infrared remote sensing map showed that there was a shadowy belt at the future construction site of the dam. Therefore, it was suspected that there might be a fault zone there. In order to prove this view, the experts concerned carried out a ground survey, a trenching survey, an underground survey, a drilling survey, and an earthquake survey. As a result, the experts

did not find any fault zone in the future construction site of the dam and wrote in their report that "the shadowy belt is not a fault zone and there is no other corresponding hidden fault zone in the same area. The shadowy belt is nothing but the comprehensive reflection of the difference between the topographic and geomorphologic factors and the vegetative and hydrogeological conditions." Since this conclusion was reached by the experts concerned after conscientiously and responsibly carrying out the relevant scientific surveys, all the experts agreed with it.

There have been many discussions on the question of silt. Although our country is in the leading position with regard to scientific research on silt, it does not mean that China can successfully solve the silt problem of the Chang Jiang. For example, after the reservoir is built, will the silt accumulated at one end of the reservoir obstruct marine transport? How should we clear the silt accumulated in front of the reservoir? After the silt is stopped by the dam, is it true that the clear water will erode the river bed in the lower reaches of the Chang Jiang and cause the Shanghai Bund to subside, as described by some experts? The expert groups have carried out a lot of scientific surveys, investigations, and experiments with regard to these questions and have built four big silt models of international standard in order to find more accurate and reliable answers to these questions.

The expert groups have also carried out in-depth and meticulous scientific demonstrations with regard to the question of emigration and have even carried out investigations in all the villages and households in the areas which might be affected by the building of the Three Gorges project.

/Reporter: Since the Three Gorges project is a huge project, once the construction of the Three Gorges project is started, will it become a "fishing project?"

/Lu Youmei:/ It is true that the Three Gorges project is a huge project, but it is certainly not a bottomless pit. The input of materials, equipment, and manpower into the Three Gorges project will be carefully calculated and placed under proper control. Moreover, manpower will be transferred to the project by stages and in groups. Thus it is not difficult to predict the number of people involved in the construction of the Three Gorges project. Scientific demonstrations have also been carried out with regard to the repayment capability of a number of projects which will be built with bank loans. In a word, we have kept clear accounts on all these questions.

/Reporter: Some people have suggested that in developing the Chang Jiang, it is better to first develop the upper reaches and then the lower reaches, and better to first develop the tributaries and then the main streams; and that in developing the Chang Jiang, efforts should not be concentrated on the Three Gorges. What do you think of this view?

/Lu Youmei:/ It is not absolutely true. As a matter of fact, the construction of power stations on the lower reaches of the Chang Jiang has always been carried out. The total installed capacity of the existing power stations and the power stations under construction on the lower reaches of the Chang Jiang has

reached 14 million kilowatts. In my view, the development of the Chang Jiang should be carried out in the light of the situation of local economic development and economic construction. Thus, we should formulate different development plans in different periods. When carrying out the scientific demonstrations on the Three Gorges project, we have also analyzed a number of plans for building key water control projects in the upper reaches of the Chang Jiang. Those key water control projects were considered capable of producing the same economic results as those of the Three Gorges project. We have also made a comparison between those key water control projects and the Three Gorges project. Only by carrying out careful selection and comparison will we be able to formulate an accurate and rational plan for the development of the Chang Jiang and make a correct macroscopic decision at the end of our scientific demonstrations.

Whether the Three Gorges project should be built or not or should be built immediately or in the future will be the conclusion of our scientific demonstrations on the Three Gorges project, and is not the premise of the scientific demonstrations on the Three Gorges project.

Lu Youmei finally pointed out that carrying out scientific demonstrations on the Three Gorges project was originally the responsibility of the Ministry of Water Resources and Electric Power. Recently, as a result of the organizational readjustment of the State Council, in order to guarantee the smooth progress of the work of scientific demonstrations on the Three Gorges project, the State Council has decided that the original Leading Group should continue to be in charge of the scientific demonstrations through to the end. The Ministry of Water Resources and Electric Power and the Ministry of Energy Resources should give their unreserved support to the work of the Leading Group with regard to the scientific demonstrations on the Three Gorges project. Therefore, it is expected that the scientific demonstrations will be completed on schedule. The result of the scientific demonstrations on the Three Gorges project will also be submitted to the central authorities for reference on schedule.

/08309

BRIEFS

HONGSHUI HE UPDATE--Two large hydroelectric power stations--Tianshengqiao and Longtan--will be built on the Hongshui He, a river rich in hydropower resources. Documents of agreement and intent were signed yesterday in Nanning by the Ministry of Energy, the State Energy Resources Investment Company, and Guangdong, Guangxi, and Guizhou Provinces, who are participating in the joint project. It is understood that this is the first such domestic joint venture between State organs and provinces to erect hydropower stations. The Hongshui He is one of three major hydropower bases in the country. The Tianshengqiao and the Longtan hydropower stations are the largest such facilities to be built on the river's 10 cascades. The installed capacity of the Tianshengqiao hydropower station will be 2.4 million kilowatts, while that of Longtan will be 4 million kilowatts, making them the two largest stations now being planned in China. The construction of the two stations will alleviate the short power supply now being experienced in the three provinces and play a major role in [the scheme to] transmit electric power from the west to the east. [Text] [40130094 Beijing RENMIN RIBAO in Chinese 20 Jun 88 p 1] /8309

An Approach to Comprehensive Territorial Planning for Coal Mine Regions

40130081a Beijing DILI YANJIU [GEOGRAPHICAL RESEARCH] in Chinese Vol 7 No 1, Mar 88 pp 46-52

[Article by Fan Jie [0416 2638] of the Institute of Geography, Chinese Academy of Sciences and State Planning Commission of the People's Republic of China: "A Preliminary Approach to Comprehensive Territorial Planning in Coal Mine Regions"]

[Excerpts] Territorial planning for coal mine regions is a strategic arrangement of regional production capability centered around the utilization of coal resource. Because of the significance of coal and coal mine regions to China's economic construction, they become the critical regions in the preliminary stage of territorial planning. In particular, the territorial planning for many regions centered around the Shanxi energy base has demonstrated the benefit of this type planning work for the development of a coal mine region. This paper introduces the methods of territorial planning for coal mine regions based on the following six viewpoints.

(1) Local and Overall

Territorial planning of coal mine regions is basic planning. Because the development of the planned region often has a wider impact over a larger area, it is of considerable importance to understand the strategy and direction of development of the region from a higher level and to confirm the role of the region in a larger region or over the entire country in order to determine the scale and speed for the development of key projects and specialized departments. Today, because of the lack of a multi-layer territorial planning scheme from the top down, we do not have the regional background and solid basis to accurately conduct planning for a coal mine area. Under these circumstances, the first problem to resolve is to accurately analyze and understand the role of the local area in the country.

Locally, coal is the basic resource for production and economic growth. It is also the factor to determine the role the area plays in the nation. Territorial planning of coal mine regions should begin with an evaluation of the coal resources. The role of the region can be clarified by analyzing the

internal conditions for the production of coal and external factors such as economic and geographic position, market situation, and transportation capacity to provide guidance in territorial planning.

The evaluation of coal resources primarily includes the following items:

1) Quantitative Analysis: Determine the feasibility and degree of assurance of the production capacity of the coal mine based on the reserve and reserve structure. Verify the prospect of scale of production capacity based on an analysis of the production capacity-to-reserve ratio. In addition, clarify the position and advantage of coal resources in regional coal production and flow based on an abundance indicator.

2) Quality Analysis: The type and quality of coal directly affect its utilization and processing. Evaluate the quality of coal from the overall perspective to determine the ratio of market demand outside the area to that inside the area. If the former is predominant, then the scale and speed of development of the coal industry belong to the planning for a larger region. Otherwise, it has an important impact on the economic growth of the coal mine region. To directly link the market to quality analysis not only provides the basis to determine the scale for coal production but also sets the direction for the overall utilization and processing of the coal resources in the area.

3) Given Condition: Combine the geographic evaluation of the coal mine with the assessment of manmade landscape (such as the relative location of irrigation projects and cities and towns) to evaluate the production condition in an area where coal mining has begun based on a technical and economic analysis.

4) Economic and Geographic Position of the Area: Understand the position of the area under planning with respect to the region. This includes all economic and geographic aspects such as mineral resources, industrial bases, economic centers and transportation networks. The larger the scale of the coal mine, the more important the quality of the coal, the larger the impact on territorial planning, and the larger the economic and geographic scale to consider.

(2) Coordination Inside and Outside the Area

If we think the relation between local and overall in territorial planning is focused on the evaluation of the coal resources, then the key issue in territorial resources assessment is the coordination of basic conditions for territorial development.

The evaluation of coal and water and other mineral resources is the principal content of coordination inside the region.

Major coal-consuming industries often rely heavily on water as well. In China, major coal-abundant areas are dry. Hence, the assessment of water resource is extremely important in the territorial planning for coal mine regions. In addition to evaluating potential water resources, we should also consider the impact on the area when these resources are utilized.

The availability of mineral resources in the region is a direct constraint to the development of local industries. The analysis is two-fold: One is to analyze the mineral resources in the region centered around the utilization of coal. First, to assess and analyze co-existing minerals. This has more significance to the comprehensive development and recovery of investment of the same mine. The other is to assess and analyze mineral resources related to the utilization of coal. This type of analysis is particularly important to the organization of a regional industrial system. The next step is to evaluate geographically or productionwise independent mineral resources of considerable size. Although they have no influence over the overall direction of development in the coal mine area, however, the need for small-scale local development and utilization can be met which has some impact on the cooperation inside the coal mine region.

Within a geographic area, it is often difficult to clarify the relationship between territorial planning and outside regions. Nevertheless, the plan should clearly mention all the aspects involved and present a list of recommendations for territorial planning at a higher level. Thus, all levels of planning can be linked together.

The regional transportation load is huge in a coal mine area. In territorial planning, the primary direction of flow, the amount of flow and the changing trend with time for different products and different transportation modes should be presented. This information provides the basis for the transportation planning for a larger region. In addition, the scale of production in the area and the transport of products outside the area must be determined. In a coal mine area, the need for transportation capacity going out is greater than that coming in, leading to an imbalance situation. To analyze the weak link in the area and the resources in the neighboring areas in order to implement pendulum transportation is an important issue.

(3) Possibility, Feasibility and Rationality

Any territorial resource has the possibility to be utilized. To achieve any objective, there are often several possible ways. Territorial development of coal mine area involves a complex possibility network. Figure 1 (omitted) shows a simplified possibility network. The eventual realization of any possibility requires that certain resources and construction conditions should be met. This is a feasibility problem. Unlike possibility and feasibility which focus on the development of a department, the key issue in rationality is to view the development of the department from a comparative and comprehensive perspective.

(4) Quantitative Relation Between Key Projects, Specialized Departments and Comprehensive Development

The economic structure of a coal mine region is arranged based on the economic strategy planned for the area. An effective method to determine the economic structure is to study the key projects, specialized departments, and comprehensive development in the area. The economic structure in a coal mine region has a unique feature in any development stage, i.e., the economy is frequently supported by a few key projects. Once these projects are completed, the economy of this area is led in the direction of specialization which limits the growth

of the overall economy. Specifically addressing this characteristic, major conflicts between specialized departments, economic departments and external construction conditions are the focus of this study. Specifically, based on an analysis of the construction conditions in the area, water resources and transportation capacity are the key factors limiting the economic development of the area. Key projects in specialized departments such as coal extraction, thermal power generation, steel and iron smelting, and cement production must be clearly identified.

A strong sense of timing must be established in the territorial planning of coal mine area. In particular, we should pay attention to the historic evolution and different stages of economic growth in coal mine regions, and the time sequence in territorial planning.

History has a very strong influence over the economic structure and characteristics of a specific region. It is not only limited by the mineral resources and natural conditions but also is related to historic, social, political and military factors. If the latter has a stronger impact on the historic evolution, the regional economic system often does not coincide with its territorial resources. It has not taken full advantage of the resources. Therefore, in the planning process, we should analyze the historic evolution of the economic development in the area and adjust the economic structure based on its resources and environment as we build up the economy in the area.

In addition, in the planning of industrial area centered around the utilization and processing of coal, we should also note the fact that the economy in a coal mine area grows in distinct stages. The focus should be different in different stages. In general, the stage of the economy in a coal mine area should more or less coincide with the stage of coal mine development. It consists of three stages: the initial stage, where coal mining is the primary economic structure, the economic recovery stage, where coal production is stable and coal processing is on the rise, and the prosperity stage, where coal production is dropping and area economy is growing at a stable pace with emphasis on processing.

Specifically with respect to the fact that regional economic development in coal mine regions has distinct stages, the focus of territorial planning should be different in different stages. If it is divided into stages A and B (the area gradually loses its characteristics as a coal mine area after stage B), then stage A should focus on the layout of regional production centered around coal to gradually perfect its economic structure to allow the economy to grow in a fast and balanced manner. Stage B should ensure that the regional economy, especially key industries directly linked to coal development, should be developed in sink with the different stages of coal extraction. The focus is different in different stages. Stage A is the territorial development planning for the coal mine region and stage B is the territorial renovation planning of the coal mine region.

The stages not only are the basis for the determination of focus in territorial planning but also are the foundation for time projection, verification and sequential arrangement.

In general, time projection is done by regression. An equation $Y' = (X')$ is fitted based on statistical data gathered over the past several years. An analysis is done based on the stage characteristics and historic evolution of coal production development to adjust the parameters in the regression equation to obtain $X = F(X)$. This result is combined into the control model for planning verification and projection control.

Verification is to confirm the overall indicator derived from the control model of a certain year by the development trend equation $X = F(X)$ to get an answer to its feasibility. Projection control is to plug the indicator value to attain for a certain year into the model to obtain the situation for each development. The projection model is more like economic planning and the control model belongs to territorial planning. Both are connected, but different.

With the scale indicators for different departments and different stages and the input-output relations between different departments and the construction cycles for the departments, it is not difficult to arrange the timing sequence for territorial planning.

Another important aspect of territorial planning for coal mine regions is the spatial arrangement of production construction. It is reflected by the rational organization of points (cities, towns and industrial areas), lines (transportation network) and surfaces (economic area with production points or zones).

A point is a major economic center in the coal mine region. There are different levels. The first level is the largest city in the area which is its economic center and the leading nucleus. Some areas may have secondary centers to share some of the functions of the largest center. The second level is cities and towns with relatively comprehensive capabilities. Despite the fact that they may be specialized in some fields, they also serve considerable political, economic and culture functions. These centers often divide a coal mine area into several connected economic development zones. The third level is highly specialized industrial and mining areas or towns. They have some influence over their neighborhood but the region they influence is not continuous.

After the development strategy for the region is determined in territorial planning, the differences and characteristics of different zones must be accurately recognized in order to come up with different directions for different zones to create a rational spatial economic structure. Specific arrangement of the spatial structure may begin with the present economic structure to find a pattern. It may also start with the development condition of each zone. In summary, the construction of the center must be based on the overall picture of territorial planning. On the other hand, the spatial organization of territorial planning must also be based on present cities and towns to the extent possible. A layout should be planned to maximize the economic benefits. The function of the center should be enhanced to drive the development of the regional economy.

The spatial economic network, including the interaction between point and surface and point-to-point and surface-to-surface relations, is realized by the transportation network. First, we must address the rational layout of key arteries in the area. In addition, conventional transportation modes and special transportation modes such as the transmission of electric power, coal slurry pipelines and conveyor belts must be rationally combined by taking direction and flow into account. Under the premise that the shipping mode, quantity, and direction of coal output are defined, the area is divided into different zones to produce and sell coal based on the location of primary energy consuming points. The sources for export and internal consumption must be identified to build the necessary transportation network.

The coordination of the planning for points, lines and surfaces can be realized through the rational utilization of the land. The utilization of the land resource must be stressed in the overall territorial planning for coal mine regions. Unreasonable phenomena in the land utilization structure, especially between a non-agricultural and an agricultural department and between agricultural departments must be illustrated to accurately evaluate and recognize the rational direction of utilization of the land resources. The scale of control and the geographic region for land utilization must be clarified to ensure the implementation of spatial territorial planning for coal mine regions.

References

[1] Industrial Layout and Urban Planning (symposium of the 1978 Changsha economic geography meeting), Science Publishing Co., 1980.

[2] Zhong Qifu [6988 1148 1133] et al., Input/Output Principle and Its Applications, Science Publishing Co., 1982.

[3] Wei Xinzhen [7614 1800 6966], Composition of Mineral Resources and Regional Industrial Entity, ACTA GEOGRAPHICA SINICA, 36(4), 1981.

12553/08309

BRIEFS

DONGSHENG COAL FIELD UPDATE--The development of the southern portion of the Dongsheng coal field in Nei Monggol is starting to roll. The recently verified coal deposits are especially large. The Dongsheng coal field is a major agenda item of the State's Seventh Five-Year Plan, and has verified coal reserves of 72.752 billion tons. The coal has a low ash, sulphur, and phosphorus content and a high heat yield. Of special importance is the fact that this high-quality coal will be very competitive on both the domestic and international markets. As of the end of the year, there were seven newly built or renovated state-run mines and 12 township-run mines with a total [annual] capacity of 2.7 million tons. This year, plans call for the opening of 6 state-run mines and 11 township-run mines for a total of 3.3 million tons. From 1985 until the end of 1987, 270,000 tons of coal were exported and this year, the figure will grow to 300,000 tons. Being constructed concurrently with the mines are roads, bridges, communications, power supply facilities and other public works projects. [Excerpts] [40130097 Beijing RENMIN RIBAO in Chinese 10 May 88 p 2] /08309

Reform Leads Petrochemical Industry to Prosperity

40130092b Beijing RENMIN RIBAO in Chinese 4 Jul 88 p 2

[Article by Chen Jinhua [7115 6930 5478]]

[Text] Five years ago, when the China National Petrochemical Corporation, an economic entity that cuts across many regions and trades, was founded, the central authorities explicitly pointed out that this was a major event in the economic structural reform in China. At that time, we did not fully understand the far-reaching significance of this policy decision. The reform practice in the past 5 years has further enlightened us in theory and practice, and has strengthened our confidence in deepening the reforms.

The reorganization and consolidation of the petrochemical industry and its establishment as a national economic entity represented a pattern adopted by the party and the state to carry out reforms in the petrochemical industry. This reform pattern proved to be in line with the characteristics of the petrochemical industry. The reforms mainly include the following five aspects:

First, with the support of the former Ministry of Petroleum Industry, the Ministry of Chemical Industry, and the Ministry of Textile Industry, 30 large petrochemical, oil refining, chemical fiber, and chemical fertilizer production enterprises, which were separately managed by different departments in different localities, together with the designing, construction, scientific research, and educational institutions in the petrochemical industry, were integrated into one economic entity under a unified leading body. This enabled them to utilize the resources according to unified planning, to improve their production and construction arrangements, and to achieve better economic results.

Second, with the support of the Ministry of Commerce, the marketing of the petrochemical products was handled by the National Petrochemical Corporation, which organized a marketing network through its subordinate marketing company, branches, and local petrochemical companies. This more effectively combined industrial production with product marketing and commercial business, and more effectively organized sales services. This includes more than 4,400 gas stations all over the country.

Third, with the support of the Ministry of Foreign Economic Relations and Trade, the import and export of some petrochemical products were directly handled by the international business company under the national petrochemical corporation or by some enterprises, especially those in the special economic zones and in the open cities. This promoted the combination of industrial production with foreign trade and the development of outwardly oriented production.

Fourth, through developing the lateral economic association between enterprises subordinate to the corporation, the sources expanded. Nearly 1,000 joint enterprises and education-research combination bodies have been set up.

Fifth, the corporation joined hands with various localities, departments, and finance institutions in making joint investment to develop more than 20 large-scale petrochemical projects, and this realized economic association at a higher level.

Now, the petrochemical corporation has developed into a large-scale integrated enterprise group, whose business scope covers petroleum processing, chemical products, chemical fiber, fertilizer, trade, and technology development. The corporation constantly pays attention to coordinated development, and prevents itself from holding a monopoly position. It is not an administrative organization, because it has to bear sole responsibility for its profits and losses and handle business independently. It is not a trade association; instead, it bears direct economic responsibility. It has to concentrate on the unified management over the entire corporation, and also gives the reins to the initiative of various subordinate enterprises. This is an exploratory economic organization. Practice in the past 5 years has shown that such an organizational form is suited to a fund-intensive and technology-intensive large-scale industry which has to maintain production continuation, and this form enables the whole trade to concentrate its strength to develop on a larger scale. Of course, all this is still being tested and the explorations are still continuing.

The Purpose Is To Develop Productive Forces

On 13 July 1983, RENMIN RIBAO published an editorial to mark the founding of the petrochemical corporation under the title of "Bringing the Advantages of the Petrochemical Industrial Economic Entity Into Play." The editorial pointed out the necessity to reasonably utilize the resources and to achieve better economic results from the 100 million tons of crude oil. This was the general principle laid down by the state for the petrochemical corporation, and it is now the starting point and also the objective of all the work of the corporation. In the past 5 years, the advantages of the petrochemical corporation, as a national economic entity, have been increasingly brought into play and fully demonstrated.

In the past 5 years, this corporation turned over more than 70 million tons of oil products (including fuel oil), chemical materials, fertilizer, and organic chemical raw materials to the state for distribution every year. In 1987, the products we turned over to the state reached some 80 million tons, showing an increase of 40 percent over the production in 1982. This marked substantial progress in China's petrochemical industry which remained in a backward condition.

In the past 5 years, the average annual growth rate was 8.8 percent. In 1987, the gross output value of the corporation reached 35.4 billion yuan. In a large-scale industry, the maintenance of such a high growth rate in so many years was rarely seen in the world.

In the past 5 years, the corporation gave the state a total of 68.6 billion yuan of taxes and profits, although it had to raise from 800 million yuan to 1 billion yuan each year. In 1987, its tax-profit contributions reached 15.8 billion yuan, showing an annual increase of 10.2 percent. Of the total tax-profit contributions, more than 56 billion yuan was directly submitted to the central treasury. This amount was equal to 1.5 times of the total fixed assets of the enterprises subordinate to the corporation in 1982.

In the past 5 years, the corporation completed capital construction and technological transformation projects with a total investment of 25 billion yuan. This was equal to more than 100 percent of the total investment made in the petrochemical industry in the 33 years before the founding of the corporation. The crude oil processing capacity now reaches 106 million tons, and ranks sixth in the world. The ethylene production capacity now reaches 1.52 million tons and ranks ninth place in the world.

In the past 5 years, a total of 29.6 million tons of oil products and petrochemical products were exported, and this earned foreign exchange totaling $6.1 billion.

In July last year, when the first-phase ethylene production projects of the Qilu and Yangzi Petrochemical Companies, whose production capacity was 300,000 tons, were put into operation after the completion of the similar project of the Daqing Petrochemical Company, Comrade Ziyang said: "In a period of less than 2 years, we increased our ethylene production capacity by 900,000 tons. This enabled us to more than double our ethylene production. This is indeed a gratifying great achievement." This represented the encouragement of the party and the people to the development of the petrochemical industry.

High-Level Policy Decision, Intermediate-Level Operation, and Grass-roots-level Initiative

In May 1984, Comrade Ziyang issued an instruction to the petrochemical corporation on its reform scheme: "In the course of reform, it is necessary to expand the self-determining scope of the grass-roots enterprises so as to arouse their initiative. Management powers should not be completely held in the hands of the corporation; otherwise, the loss will outweigh the gain." In the past 5 years, we have more and more deeply understood the importance of this instruction.

From 1985 to 1990, the petrochemical corporation undertakes the contracted investment and output targets assigned by the state. Under this premise, contracted management is conducted at three levels of this corporation. The main contents of management contracts vary from one level to another. We describe this management system as "high-level policy decision, intermediate-level operation, and grass-roots-level initiative." At the high level, the

state fixed four targets for the corporation (that is, the targets for investments, output, tax types and rates, and profit retention methods) and the state also guarantees the supply of four major things for the corporation (namely, raw materials, fuel, electrical power, and transportation means; working funds for production and construction; materials and equipment distributed by the state; and manpower). The corporation in turn has to guarantee four things to the state (namely, financial contributions, the output of the major products, the product quality, and the additional development funds). On the basis of the second-phase measures for replacing tax payment with profit delivery, the corporation is able to retain its additional profits after paying various taxes. At the intermediate level, the corporation assigns investment and output targets to various subordinate enterprises, and links their total wages with their economic results. At the same time, the enterprises have to undertake contracts on their development, construction, technological progress, and equipment renewal. On the basis of fulfilling the investment and output contracted targets, the enterprises enjoy more self-determination in their own management. At the grass-roots level, through such measures as linking the payroll with the business results, adopting an input-output contract responsibility system, fixing a ratio between the wages to the output value, and assigning project contracts, the enterprises are able to separate their management from ownership and to achieve rights and benefits corresponding to their responsibilities. This makes the grass-roots units and the workers realize that their work results have a direct bearing on their economic interests. The enterprises have full power to handle their surplus products, to operate processing production, to possess their own funds, and to decide the personnel appointments below the level of factory directors.

In practice, we realize that overall planning, coordination, and services are major functions of a national economic entity. "United management" should include "separate and independent operations," and the two sides should be reasonably combined. The contract system should give play to the initiative of the contract undertakers with more powers being delegated to them. All grass-roots enterprises should be able to manage their own affairs, and the reins should be fully given to them. The corporation should not meddle in the management and business affairs of the subordinate enterprises, still less can it withhold the powers that the state delegates to the enterprises.

New Issues To Be Solved in the Reforms

Reform is a brand-new task, and will inevitably have an impact on the interests of various parties concerned and the people's rights and interests. Therefore, it is normal that different opinions appear in the course of reform. Reform needs explorations and practice. The problems and contradictions that we encounter in reform can only be solved through deepening the reforms. In fact, we have continuously summed up experience in the reform practice, readjusted our policies, and rationalized various relations so as to advance the reforms smoothly.

Over the past 5 years, the petrochemical corporation has made certain achievements, and all this should be attributed to the correct policies and decisions of the central authorities and the joint efforts of the workers as well as the

great supports from various parties concerned. There remain some problems in our work. As an economic entity, according to the state decision, we manage most petrochemical enterprises in our country and undertake the state tasks. However, we cannot and also should not monopolize the whole industry. The petrochemical industry in our country is still not developed enough. In particular, the per capita output of petrochemical products remains at a very low level. There are still many contradictions in our development and reform. There are still defects and problems in our planning, coordination, and services, and in our relations with various parties concerned. We will further exert ourselves to improve our work and to firmly implement the spirit of the 13th party congress and the First Session of the Seventh NPC. Reform will be the general guideline for all our work. The petrochemical corporation will become an economic entity with "advanced technology, advanced management, updated information, and remarkable economic results" and will play a greater role in developing the petrochemical industry.

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Puyang-Linyi Petroleum Pipeline Work Completed

40130092a Jinan Shandong Provincial Service in Mandarin 2200 GMT 30 Jun 88

[Excerpt] Construction of the first stage of the petroleum pipeline from Henan's Puyang to Shandong's Linyi has successfully been completed ahead of schedule after 6 months of intense construction. The Puyang-Linyi petroleum pipeline, a key state project, is a subsidiary project of the Zhongyuan oil field that will increase [the volume] from the present 7 million tons to 12 million tons. However, the annual petroleum transmission capacity of the existing pipeline from Puyang and Linyi is only 5 million tons, thus lagging far behind the demand for opening up the oil field.

The just-completed first stage of the project basically runs parallel to the original line, and big pipes with a diameter of 529 millimeters were used. The project included the laying of pipelines from the Zhongyuan oil field to Shenxian County and from Gaotang to Linyi, with a total length of 110 kilometers, and cutting through some 90 large and medium rivers and canals. For this project, more than 500,000 cubic meters of earth and stone were excavated. Upon the completion of the first stage of this project, more than 1 million yuan worth of energy resources will be conserved each year, and the petroleum-transmission capacity will be raised, thus basically meeting the demand for expanding the production of the Zhongyuan oil field.

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BRIEFS

DAQING IN DECLINE--According to a ZHONGGUO XINWEN release, the Daqing oil field has started to enter a period of difficulty. The problem now being experienced is one of stable production characterized by a decrease in the [once] abundant natural resources, a growing water content, and an accelerating drop in the flow of crude. Economic strategists point out that now is the time for Daqing to consider the future. The Heilongjiang Provincial Party secretary, Sun Weiben, points out that developing substitute products is the only way to achieve a smooth transition that would assure long-term stable economic development. [Excerpt] [40130090 Beijing BEIJING KEJI BAO in Chinese 28 May 88 p 1] /08309

QINGHAI NATURAL GAS STRUCTURES--Xining (CEI)--The Qinghai Petroleum Bureau recently found five natural gas structures in the east of the Qaidam Basin, Qinghai Province. The total area of the Taidong, Sedong No 1, Sedong No 2, Tuoxi, and Taixi natural gas structures covers 214 square kilometers. Experts expect to find natural gas in the east of the Qaidam Basin. The Tainan structure was found last year also in the east of the basin. A well producing high quantity industrial gas was drilled there. The findings have attracted the attention of the departments concerned. Having consulted experts and the scientific researchers of the Qinghai Petroleum Bureau, the Ministry of Petroleum Industry has decided that the prospecting of gas field in the Qaidam Basin will be emphasized during the Seventh Five-Year Plan from 1986 to 1990. A group of scientific researchers and four seismic prospecting teams have been sent to the east of the Qaidam Basin on a survey trip. [Text] [40100029a Beijing CEI Database in English 13 Jun 88] /08309

NEI MONGGOL OIL FIELD CONSTRUCTION--Shijiazhuang (CEI)--The Huabai oil field will speed up the construction of the Alxa oil field in Erenhot, Inner Mongolia this year. The Ministry of Petroleum Industry decided in January that the construction of the Alxa oil field will be speeded up so that it will be able to produce 1 million tons of oil annually by 1990 with its petroleum pipeline stretching for 360.5 kilometers. An oil refinery capable of processing 1 million tons of oil will also be set up by 1992. Drilling has started on 21 wells of the new oil fields, of which 12 have been completed. [Text] [40100029b Beijing CEI Database in English 10 Jun 88] /08309

Rebuttal to Nuclear Power Leading Role Argument Offered

40130087 Beijing RENMIN RIBAO (OVERSEAS EDITION) in Chinese 21 Jun 88 p 4

[Article by Yu Dehui [0151 1795 6540]: "More Discussion of the Nuclear Energy Development Issue"]

[Text] Recently, the overseas edition of RENMIN RIBAO took up the question of China's development of nuclear energy, particularly whether nuclear energy would become the country's main source of energy by the year 2040, publishing articles by Messrs Guo Xingqu [6753 2502 3255] and Zhai Yongping [5049 3057 1627]. The writer would also like to express some views on this matter.

1. By the 21st century, nuclear energy will still be a supplementary source of energy for the world.

People have pinned great expectations on nuclear energy ever since its discovery, hoping to use it to solve mankind's energy problems. Several decades have passed, however, and nuclear energy has by no means developed at the speed or on the scale that people had originally anticipated. As a result of a series of major nuclear power accidents in recent years, public continuation and development of the anti-nuclear movement, and the rising cost of nuclear power, the tempo of Western industrial nations' development of nuclear energy has slowed markedly. In many Western nations, there will be virtually no further development of nuclear energy after 1990, and both Sweden and Switzerland have announced the gradual dismantling of existing nuclear power plants. In its "Annual Report on Changes in World Energy Sources, (1987-1988)," the Energy Economics and Policy Research Institute of the French National Scientific Research Center predicted that by the year 2000 nuclear energy will account for no more than 8 percent of the total makeup of the world's energy. Though numerous energy economists hold different views about prospects for the development of nuclear energy, there is general agreement among them that by the middle of the 21st century, nuclear energy will still be a supplementary source of energy for the world.

2. Several Major Obstacles to the Development of Nuclear Energy

a. Economics. To a very great extent, a country's development of nuclear energy depends on economics. Major technologically developed countries that have energy resources have not developed nuclear energy on a large scale because

nuclear energy is not sufficiently economically competitive in these countries. Even in France, where there is a shortage of energy resources (except uranium) that necessitates the development of nuclear energy, and where progress in its development has been generally accepted, the continued development of nuclear energy will be difficult. This is because, despite the competitiveness of nuclear energy in the production of electric power in France, nuclear power enjoys no advantage in the energy use market. Even though the per unit electric power production cost in France is slightly lower than for thermal power stations that burn imported energy (but far higher than for French hydroelectric power. France has already developed 95 percent of its water energy potential), nuclear power plants' per unit installed power costs (fixed assets) are approximately twice again as high as for coal-fired power plants.

b. Rigidity of Nuclear Energy System Operation. It is generally known that electricity is the main form in which nuclear energy is used. Since nuclear power plants are rigid in the way they operate (operating all year round), nuclear power can be used only to meet basic load requirements. In France, nuclear power accounts for 75 percent of the total electric power generated, and nuclear power facilities are already in serious oversupply. Use of electric energy to satisfy some heating needs (such as for heating, steam, etc.) does not make economic sense. This shows that development of nuclear energy is limited by the rigidity of nuclear energy system operation.

c. Social Problems. The "nuclear power social acceptability crisis" is yet another reason making the rapid development of nuclear energy difficult. In the Western world, nuclear energy has become one of the new focuses of social controversy. A series of major nuclear energy accidents has not only heightened public apprehension about nuclear energy, but improved nuclear safety measures have also gradually driven up the cost of producing nuclear power. The slight competitiveness that nuclear energy enjoys in the production of electric power has also begun to make people doubtful.

d. The outlook for the new technology is not optimistic. World uranium resources (proven resources plus prospective reserves) may be exhausted around the year 2040. Some people pin hopes on metallic nuclear fuel fast reactors, of which the French "Super Phoenix" reactor is an example. This fast breeder reactor's uranium utilization rate is between 50 to 80 times higher than for pressurized-water reactors. Nevertheless, this is a long way from meeting the anticipated utilization rate of metallic nuclear fuel fast reactors. Reportedly, the per unit cost of electric power production for the "super phoenix reactor" is more than twice again as high as for pressurized-water reactors (and this price seems to have been underestimated). At more than double the price of existing sources of energy, this "new energy source" is not competitive.

Finally, a fairly long time is required from the beginning of research on new energy technology to its application to the economy. Following a historical analysis of the EEC and its member states, it was found that it takes more than 20 years for a new energy resource (including nuclear power from forced water reactors) to rise from 1 percent to 10 percent of the total supply of energy.

3. The inevitability or the likelihood that nuclear energy will become China's main source of energy by the year 2040 is questionable.

First of all, China has only limited uranium ore resources, while conventional energy resources are relatively abundant.

Second, the policy of opening to the outside world has enabled China to enter the great world economic cycle, and the ensuing international competition makes it more necessary that we do all possible to lower our product costs. China's energy prices have a direct bearing on the international competitiveness of its export products. Since coal is an abundant resource, it is cheap and widely used, and it is expected to be the chief source of energy in China during the 21st century. This trend merits our serious attention.

Next, ever since the petroleum crisis, numerous countries, particularly Western countries, have taken in the historical lesson of our reliance on one energy source. They have adopted a policy of "diversified sources of energy" and a "pluralistic" strategy with regard to the supply of energy, actively developing the use of new technology (such as fluidized-bed furnaces, coal gasification and liquefaction, energy saving techniues, etc.) for the development of conventional sources of energy. These new techniques can ameliorate the environmental and transportation problems resulting from large-scale use of coal. In addition, they have encouraged and promoted the development of a series of various new techniques for obtaining energy (such as hydrogen energy, solar energy, geothermal energy, synthetic fuels, non-conventional petroleum, nuclear fusion, fast breeder reactors, etc.). It is predicted the 21st century will be an age of "multiple energy sources."

Finally, fast breeder reactors are a piece of very high technology. Until such time as developed countries use them on a large scale, they will not readily agree to the transfer of this technology. We will have to depend on our own brainpower in guiding the development of such high technology. However, China's basic industries are antiquated, and they have difficulty in producing some crucially important components. The necessity for investing large amounts of manpower and material resources under present circumstances in the advanced development of a new technology for producing nuclear power is a matter that merits discussion.

Comprehensive study of energy economics has become a major topic among those who study energy economics. Without doubt, the recently established Ministry of Energy will formulate a long-range development strategy for China based on multiple sources of energy, will promote rational use and development of energy sources, and will actively expand the study of energy economics to obtain greater advantages.

9432/08309

Strategic Study of Wind Power Development

40130080 Shanghai DONGLI GONGCHENG [POWER ENGINEERING] in Chinese No 1, 15 Feb 88 pp 3-7

[Article by Lu Zehe [7120 0463 7729]: "Research on Wind-Powered Electricity Generation Strategies"]

[Excerpts] Abstract

This article introduces the concept of wind-powered electricity generation in China, foreign experiences in developing this type of power generation, and technical countermeasures for development in China. It also puts forth the principle that the near-term focus of wind-powered electricity generation should be household electricity use and that wind-powered generators should be small and operate independently outside of grids.

Preface

As everyone knows, wind energy's rich reserves, non-polluting nature, and renewability have made it a part of world energy resource strategies which has received widespread attention. It remains concentrated in the developed nations and focused on wind powered electricity generation, and it has its own characteristics. The level of wind energy utilization is very low in most developing nations, and mainly involves assistance from developed nations and some trial points. Beginning in the 1950's and 1960's, a few units in China's agricultural machinery system used wind power to generate electricity for pastoral regions on the Nei Monggol plains, and there was limited research on the use of wind power for water lifting. Investments were made to build a plant at Shangdu in Nei Monggol, but it was small in scale. In the past decade, and particularly in the last 5 or 6 years, wind energy development and utilization have grown extremely quickly in China. Many units are quite interested in moving into this area. It may be said that China's wind-powered electricity generation industry is entering a new stage of development. Obviously, it is extremely necessary and urgent that we face this situation, borrow from foreign experiences, and use strategic heights to study paths for wind power exploitation and development in China to derive a more unified understanding and give a correct orientation to initiatives in this area.

I. The Situation in China

The development of wind-powered electricity generation in China began on the plains of Nei Monggol Autonomous Region. At the end of 1986, there were 33,683 small residential power storage-type wind-powered generators on the Nei Monggol plains, equal to about 89 percent of the total in China. Statistics on sales at 21 producing plants show that China had about 38,000 small-scale wind-powered electricity generating units in 1986. Calculated at 1:2 based on unit generating capacities of 50W and 100W, the total installed generating capacity would be about 3,160kW. This figure is an insignificant portion of the total installed capacity of China's generating units. However, for 30,000-plus households using wind-powered generators, especially pastoralists on the Nei Monggol plains, they have inestimable social benefits. Wind-generated electricity has enabled many pastoralists to watch television and brought modern civilization to the plains. It is for precisely this reason that television has become an irreversible factor in the development of wind-powered electricity generation in pastoral areas of Nei Monggol.

Examining the distribution of China's small wind-powered electricity generators over the past few years, their range of use is expanding from pastoral regions on the plains into agricultural regions, from Nei Monggol to other provinces and autonomous regions, and from agriculture and animal husbandry into other industries. Several years of experiments by the General Housing Administration have confirmed the feasilibity of developing wind-powered electricity generation at island companies and border sentry posts to conserve oil fuel for power generation via internal combustion engines. Wind-powered generators at the next higher level of capacity are needed, however. Other areas in China like Shandong and Xinjiang have shown considerable interest in wind-powered electricity generation connected with large and medium-sized grids. Shandong Province suggested the principle of large and medium scales, connection with grids, and a focus on productive uses. They have tried to use wind power to alleviate the severe power supply shortage in Shandong. They have imported large and medium-sized foreign wind-powered generators and set up test sites for power generation connected with grids.

According to incomplete statistics, nearly 100 enterprises in China produce wind-powered generators, including those preparing for production, and they include about 60 main machinery plants. They can produce wind-powered generators of 2kW and below and several types of wind-powered water lifting machines. Most, however, are 50 to 100W generators and output at the enterprises is limited. Only five plants can produce more than 1,000 units a year. Four plants are located in Nei Monggol Autonomous Region. The economic support policies of the Nei Monggol government enabled output at two plants to reach 7,000 to 8,000 units in 1986.

More than 60 units in China are studying wind energy development and utilization. Most are working to develop wind powered generator products. A large number of projects are underway. With the exception of wind-powered generators at the MW level, it would seem that all the various types of generators being studied throughout the world can be found in China now. There is serious redundancy in

many projects. The largest unit capacity generator now being developed is the 200kW generator at the Ministry of Water Resources and Electric Power's Hangzhou Machinery Design Institute. It must be pointed out that although much research has been done on wind-powered generation equipment in China, few have gone into production, even fewer are being produced in large numbers, and scientific research is detached from production. Regulations for testing and acceptance of many new products are not strict.

China now has established 16 wind-powered generator testing sites and wind powered electricity generation demonstration sites. The demonstration wind fields focused on power generation have an installed generating capacity of almost 1,500 kW. Fujian's Pingtan Wind Field is the largest. It has four 200kW generators imported from Belgium and other generators developed in China. The first to be connected with a large land-based grid to generate power and formally sell electricity is the Malan Wind Field in Shandong's Rongcheng County, which has three 55kW generators imported from Denmark and one 20kW generator developed in Zhejiang. China's first wind field to go into operation and be connected with a small island grid using diesel generators is on Zhejiang's Dachen Island. It has one 20kW generator developed by the Zhejiang Institute of Machinery Science. These two wind fields have been in normal operation for more than 1 year.

Many international exchange activities also have been carried out in recent years. By the end of 1986, 33 wind-powered electricity generator prototypes with capacities of 24W to 200kW had been imported through various arrangements. Three small-scale wind powered generator technology import projects were completed. It is extremely rare for a small industry in China with just over 14 million yuan in annual gross value of output to be involved in international exchanges. It also should be pointed out that with the exception of a few technical import projects, very few producing plants are able to participate in this sort of foreign activity.

Many State Council ministries and commissions are concerned with strengthening leadership over these vigorous wind-powered generator R&D activities. With support from the State Bureau of Standards, the inter-ministerial National Commission on Standardization of Wind-Powered Generators was established, and it has done a great deal of work in the area of formulating technical standards for small-scale wind-powered generators.

The above situation would indicate that, with the exception of windless regions in China's interior, most of China's provinces, municipalities and autonomous regions and 12 ministries and commissions including the State Council, the National Defense Science, Technology, and Industry Commission, the Chinese Academy of Sciences, and others should be involved. The strong momentum of wind powered electricity generation development and utilization which is of national significance continues unabated. In actuality, it has only formed a "wind-powered electricity generation fever." This "wind power fever" certainly does not conform to actual market demand for wind-powered generating equipment. This is particularly true of the market for large and medium sized wind powered

generators, which remains unclear. Thus, the speed and breadth of this lead research, the orientation of research, and the suitability of so many enterprises going into operation are questions which should be studied from strategic heights.

III. Paths To Develop Wind-Powered Electricity Generation in China

China's national conditions should be the starting point for paths to develop and utilize wind energy in China. They are determined primarily by wind power resources in China's windy regions, the social, economic, and energy resource demand situations, and the capacity for comprehensive technical development.

With the exception of some local areas, China's windy regions basically are scattered around its borders. There are two main wind belts. One lies in the northern part of the "three norths" [northeast, north, and northwest China] from eastern Heilongjiang in the east to Qinghai and Tibet in the west. The other is along China's eastern coast, running from Liaodong in the north to Hainan Island in the south. These are two enormously different regions.

1. The wind belt in the northern part of the "three norths" region covers a large area and has a sparse population, few cities, inconvenient communications, scattered settlements in agricultural and pastoral regions, and a backward economy and culture. All of China's pastoral plains regions are located here. This region has the most severe rural energy resource supply and demand problems in China. The contradiction between supply and demand for electric power is particularly acute, the power grid coverage rate is extremely low, and it will be difficult to have a power grid for quite some time to come.

We are in the last 10-plus years of the 20th century, but 40 percent of China's rural population still goes without electricity. This must be seen as a troubling problem. Only 12 years lie between now and attaining the goal of being relatively well-off in the year 2000. Without electricity, talk of becoming relatively well-off is meaningless, as is economic development and the two types of civilization [material and spiritual]. The state plans for 90 percent of peasants to have electricity by 2000. It also is both uneconomical and unrealistic to depend on power grids for centralized electricity supplies in an area like the northern part of the "three norths" region which is so vast and has scattered settlements. A favorable condition for achieving this goal is that 80 percent of the rural population without electricity lives in this windy region, and although the average annual wind velocity is not great, the windy season is rather long. Thus, using wind-powered generation to meet the electricity needs of agricultural and pastoral residents in regions without electricity is politically necessary, economically rational, and technically feasible. Without a doubt, this would be "timely assistance." In this sense, there is reason to treat the development of wind energy as a rural energy resource question.

There are two main types of generators used for wind powered electricity generation in this region. One is a household model which operates independently, stores electricity, and transmits it as DC or reverse AC. The single unit generating capacity ranges from 100 to 300W. It basically can meet household power requirements for lighting, television, and other appliances.

Another type is used by small isolated settlements. It operates independently, stores electricity, and transmits it as DC or reverse AC. It can unify electricity supplies for all households or allow each household to swap storage batteries. The single unit generating capacity is 1 to 5kW. This utilization pattern must undergo practical trials to solve administrative problems to facilitate its acceptance by peasants and pastoralists. This type of wind powered generator also has been provided for military use in windy regions without electricity, at meteorological stations, radar stations, and television repeater stations, and at small railway stations which lack electricity. Capacity can vary as needed.

We should note that, technically speaking, these wind powered generators have a large power generation capacity which requires a long electricity generation period and annual distributional stability. Every effort should be made to assure that each household can use them for the maximum number of days each year. For this reason, the startup wind velocity, power generation wind velocity, and quota wind velocity should be somewhat low. Permanent magnet generators at less than 1kW are best.

Providing power for rural households in the northern "three norths" region is an important medium and short-term development goal for wind-powered electricity generation in China, and it is an important aspect of paths for wind powered generation in China. With improvements in conditions and real demand in these regions, they can shift gradually from focusing on household use to a combined focus on household use and production.

2. The coastal wind belt. Wind power resources here are even better than those in the "three norths" region. They include the two parts of the continental margin within several 10km of the coastline and all islands.

Social conditions in the continental margin region are exactly the opposite of those in the northern part of the "three norths" region. This region has a dense population, concentrated settlements, a developed economy, and a high grid coverage rate. It has a power shortage, however, and is in a situation of having grids but no power. This is particularly true of the lack of assured household power supplies for peasants and fishermen. In this region, it would be realistic and feasible to develop small wind-powered generators for households in areas with severe power shortages and to develop small wind powered generators for use on boats to supplement the household power needs of fishermen. This market should be opened.

Islands are the weakest link in power supplies in coastal regions. The problem is not that they lack electricity but that they rely on diesel generators for power generation. There is an oil shortage and power generation costs are rather high. To make full use of the islands' advantages of good wind power resources, medium-sized wind powered generators connected to grids can be combined with small household wind-powered generators operating independently. Wind power should become a primary source of energy for power generation on China's islands.

The long-term power shortage in China has led to rapid growth in the number of diesel reserve generators. Expanded use of diesel generators to generate power conforms neither to China's limited fuel oil for thermal power nor to the energy resource policy of using fuel oil for portable generators. The installed generating capacity for diesel generators in China has reached 1,300kW. Most are found in windy regions along the coast. The development of medium-sized generators which would operate instead of or in conjunction with diesel generators would be very important in conserving diesel oil. The costs of wind-powered electricity generation can hold their own. This is another focus of wind powered electricity generation in China. Technological breakthroughs are needed.

Careful economic analysis has been carried out in experiments using wind-powered generators of 50kW and above operating in clusters to form a large power grid to alleviate the power shortage in grids. The biggest problem with using large wind-powered electricity generation fields is that yearly instability in wind power creates instability in electricity supplies. At the Malan Wind Field in Rongchen County, Shandong, for example, there basically is no wind for 6 to 9 months each year. China's electric power industry is operating at full capacity and basically has no reserve generators. It is even more apparent that wind-powered electricity generation cannot stabilize the power shortage. Moreover, the high investments per unit of installed capacity and high cost per kWh in large wind power fields, the lack of technical advances in wind power products, and other things must be dealt with earnestly.

The Malan Wind Power Field in Rongcheng County, Shandong has an installed generating capacity of 185kW, so the power it supplies to Roncheng County, which has 9,000kW in thermal power, has absolutely no effect. For the Chengshantou 600kW power supply line where the Malan Wind Field is located, however, it plays a definite supplementary role during the windy season. Line and transformer losses in this arrangement can be as high as 21 percent, however, so it can only be connected to grids at low voltages and supply power locally.

Statistics for a year of operation at the Malan Wind Power Field indicate that each of the Danish 55kW wind-powered generators along the coast at Rongcheng, which has rather good wind conditions, operated for 4,100 to 4,400 hours a year, an annual operation rate of only about 47 percent. Each unit generated 110,000 kWh a year, a capacity utilization rate of 22.9 percent. This shows that the foreign path of high wind velocity quotas does not conform to utilization requirements of China's wind conditions.

In summary, by starting with concrete conditions in China's windy regions and the power supply situation, the development of wind-powered electricity generation in China in the medium and near-term should focus on providing household electricity supplies to rural areas (pastoral regions and islands) not connected to grids. This is the basic path for the development of wind powered electricity generation in China.

12539/08309 END

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